[*Seal of the Soviet Union*]

(19) **SU** (11) **1813171 A**

UNION OF SOVIET SOCIALIST REPUBLICS

(51)5 E 21 B 43/10

USSR STATE PATENT DEPARTMENT

PATENT SPECIFICATION

(21) 5000892/03
(22) July 12, 1991
(46) April 30, 1993, *Bulletin* No. 16
(71) Tatar State Scientific Research and Design Institute of the Petroleum Industry
(72) G. S. Abdrakhmanov, R. Kh. Ibatullin, V. G. Zhzhonov, I. G. Yusupov, N. Kh. Khamit'yanov, and A. G. Zainullin
(73) Tatar State Scientific Research and Design Institute of the Petroleum Industry
(56) Bulatov, A. I. *Manual of Oilwell and Gaswell Casing and Cementing* [in Russian], Nedra Publishers, Moscow, 1981, pp. 137–146.
Ibid., p. 142.

(54) METHOD OF LANDING A CASING LINER IN A WELL

(57) Use: in the casing and cementing of wells. Effects an increase in the efficiency of the method through a simplification of the technology, a reduction of material costs, and an acceleration of the well-construction process. The essence of the method is that before the liner is run into the borehole, at least one of its pipes in the top part of the casing string is shaped. When this is done, at least two diametrically opposed longitudinal corrugations and cylindrical ends with connecting threads are formed thereon. Then the liner is run into the borehole. When this is done, its top part is set at the bottom end of the previous casing string. Then the well is flushed. After the liner is run and the well is flushed, an overpressure is produced in the liner cavity. When this is done, the shaped pipe is straightened until its walls press tightly against the walls of the bottom end of the previous casing string. Two illustrations.

The invention relates to the mining industry and can be used during the running and setting of casing liners in wells.

The object of the invention is to simplify the technology for setting liners, to reduce material costs, and to speed up the well-construction process.

Figure 1 presents a schematic diagram showing the layout of equipment for implementing the liner-setting method; Fig. 2 presents a diagram of an implementation of the method.

The method is carried out in the following sequence.

From the weight of the liner 1 (Fig. 1), the necessary length of the shaped pipes 2 on which the liner will be hung is determined by calculation. Then these pipes are shaped by the known method to form at least two longitudinal corrugations (indentations) 3 positioned on the pipe diametrically opposite each other, and cylindrical ends 4 with connecting threads 5. Here, the entire pipe is swaged so that the diameter of the circumscribed circle is equal to the outside diameter of the pipe's cylindrical ends. This ensures normal running of the shaped pipes inside the previously set casing string 6.

In the event that just one corrugation is made or that the corrugations are on some single section of the surface of pipe 2, the running and straightening of the shaped pipes as they are set in the borehole will be complicated, and a tight seal will not be provided between them and the casing wall 6, since in these cases the significant difference in the radial movements of the convex and concave sections of the pipes as they are straightened in the borehole will not allow full deployment of the shape.

The outside surface of shaped pipes 2 is covered with a sealant, they are attached to the top end of liner 1, and shoe 7 with seat 8 for ball valve 9 and with a back-lift limit switch 10 for it are attached to the bottom end of the liner. Before liner 1 is run into the borehole, the interval of the casing string 6 in which the shaped pipes 2 must be set is smoothed with a reamer. After the assembly is run into the specified borehole interval on drillstring 11 with expander 12, the well is flushed, then ball 9 is released, and by injecting washing fluid into the cavities of liner 1 and shaped pipes 2 the pressure necessary to pressurize the entire assembly is generated in them; as a result of this pressure, the shape of pipes 2 is straightened and they are pressed tightly against the walls of the previous casing string 6 (Fig. 2). By tightening the tool 200 kN beyond its weight and setting the tool, the stability of the hanger vis-à-vis their axial motion is checked. Then, by rotating the drillstring 11 expander 12 flares shaped pipes 2 while at the same time washing them. After shaped pipes 2 are expanded, the casing string 6 together with liner 1 is pressurized to the internal pressure. If the hanger is not hermetically tight, the expansion is repeated.

Upon the completion of work related to setting the liner, the drillstring 11 with expander 12 is pulled, the bit is attached, shoe 7 with ball valve 9 is drilled through, and drilling of the well is continued.

The proposed method of setting a liner also can be implemented in the wellbore of an uncased well, and also when lost-circulation zones are present, since the effect of these zones on the liner-setting process is eliminated when the proposed technology is implemented. In these cases, work is carried out in the same sequence.

If the liner needs to be cemented, this operation can be carried out immediately after well flushing, before shaped pipes 2 are straightened, by injecting plugging material into the cavity of the pipes and using washing fluid to force it through shoe 7, before which ball 9 is released. After the plugging material is forced past liner 1, ball 9, on passing through the ball-valve back-lift limit switch 10, lands in seat 8. As a result of the closing of ball valve 9, a pressure is generated in the cavity of liner 1 that results in straightening of the shape of pipe 2 with simultaneous pressurization of liner 1. Then the stability of the hanger vis-à-vis axial motion is checked as described above, and as the drillstring 11 is rotated while at the same time washing is performed, shaped pipes 2 are expanded against the casing walls 6. When this occurs, any plugging material above liner 1 also is

washed out at the same time; then the tool is pulled, and after waiting on cement the casing string 6 together with liner 1 is pressure tested, shoe 7 with ball valve 9 is drilled through, and drilling of the well is continued.

The engineering and economic effectiveness of the method consists in the simplification of the technology for landing casing liners and in a decrease in material costs as a result of the elimination of the disconnectors and hangers of complex design that are used in liner setting, as well as the cementing thereof, which is accompanied by frequent accidents, and [by the reduction of] time spent waiting on cement. All these factors make it possible to speed up the well construction process by up to 20%, and to increase the reliability of liner hanging. Furthermore, the proposed method allows expansion of its applicability, since it can be used in either a cased or an uncased wellbore, with or without cementing of the liner, and regardless whether any lost-circulation zones are present. The use of this method also makes possible a significant decrease in losses of hole inside diameter.

Claims

A method of landing a casing liner in a well, which includes running the liner into the hole, setting its top part in the bottom end of the previous casing string, and washing the well, which is *distinctive* in that in order to increase the efficiency of the method by simplifying the technology, reducing material costs, and speeding up the well-construction process, before the liner is run into the well at least one of the pipes in the top part of the casing is shaped to form on it at least two diametrically opposed longitudinal corrugations and cylindrical ends with connecting threads, and after the liner is run and the well is washed, an overpressure is produced in the liner cavity, and the shaped pipe is straightened until its walls press tightly against the walls of the bottom end of the previous casing string.